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# Foreign Acquisitions, Ownership Changes, and Exports

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## Abstract

We develop a three-country model to examine the effects of foreign acquisitions on the decision of target firms to export (to a third market). We show that foreign acquisitions may raise or reduce the targets' probability to export (extensive margin), depending on whether the targets have exports before the acquisitions. Due to ownership changes in the target firms, three possible channels through which the acquirers (new owners) alter the targets' (previous owners) export decision are identified: fixed-cost jumping, technology transfer, and global market reorganization. We then use firm-level data of foreign acquisitions on Chinese firms from 2000 to 2006 to test the main predictions of the model. We find evidence that foreign acquisitions raise (reduce) the Chinese target firms' probability of exporting to a third market if the targets do not (do) have exports to that market before the acquisitions. Technology transfer is not observed. Evidence implies that fixed-cost jumping is used to raise the targets' export extensive margin, while global market reorganization is a key motive for the acquirers to reduce the targets' export extensive margin.

**Keywords:** Foreign acquisitions; exports; extensive margin; global market reorganization; technology transfer; fixed-cost jumping, China.

**JEL Code:** F23, G34

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# 1. Introduction

International trade and foreign direct investments (FDI) are two important phenomena of globalization. Both international trade and FDI have grown much faster than the world production in recent decades.<sup>1</sup> Cross-border mergers and acquisitions (M&As) are a significant component of FDI, roughly about one third of the total FDI flows. According to the United Nations Conference on Trade and Development (UNCTAD) (2010), the value of cross-border M&As rose from less than USD100 billion in 1987 to USD720 billion in 1999, USD900 billion in 2006, and USD1.2 trillion in 2010 (expected). Trade and FDI are interrelated. In this paper, a theoretical analysis and an empirical analysis are performed to investigate the effects of foreign acquisitions on the decisions of target firms' export – an important issue that has not been studied in the literature.

We analyze the above issue from the perspective of multinationals' global market strategy with foreign acquisitions. Specifically, we investigate how a multinational, after acquiring a foreign firm, alters the export decision of foreign target firm to maximize its global profit. To put our discussion in perspective, let us consider a model with three countries. A multinational firm from a country acquires another firm (target) from another country. The acquisition results in ownership changes, which enable the multinational (the acquirer) to dictate the export decision of target firm. In particular, the multinational reconsiders its target firm's pre-acquisition export decision to a third market (in a third country). The outcome depends on whether or not the target has exported to the third market before the acquisition, whether or not the acquirer has exported to the third market before the acquisition, the acquirer's and the target's productivity levels, and the international transportation costs. Three results are derived. The first is about the change of the target's export extensive margin (i.e., the likelihood of export). We find that foreign acquisition raises the non-exporting target's (i.e., the target that has not exported to the third market before the acquisition) export extensive margin, but reduces the exporting target's (i.e., the target that has exported to the third market before the acquisition) export extensive margin.

The second result is about the possible channels through which the acquirer alters the target's export decision. On one hand, the acquirer can make the non-exporting target to export by (i) helping the target jump over the fixed cost of export, (ii) transferring technology to the target firm to raise its productivity, or (iii) reorganizing the multinational firm's global market, i.e., the acquirer withdraws itself from the export market and lets the target replace it. On the other hand, the acquirer may withdraw the exporting target from the third market in order to reduce the competition if the acquirer is also exporting to that market. This is also the multinational's global market reorganization strategy.

Third, we derive the necessary and sufficient condition for the multinational to adopt the global market reorganization strategy. If the target firm's trade cost is much larger (smaller) than that of the acquirer, the acquisition will withdraw the target (the acquirer) from the export market.

The main results are tested using the data of foreign acquisitions on Chinese firms from 2000 to 2006. China is a good choice for our empirical test because it is one of the largest exporters in the world and the second largest FDI

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<sup>1</sup>According to the World Trade Organization's (WTO) report (2007), the average annual growth rate of the volume of world exports was 6.2 percent during 1950-2005, which exceeds the global output growth rate by 2.4 percentage points. Based on the data from the UNCTAD's World Investment Report (2005), it is calculated that the average annual growth rate of inward flows of FDI is higher than 23 percent.

recipient, after the US, receiving about half of the FDI flows to developing countries (UNCTAD, 2010). In our data, each observation represents one foreign acquisition on a Chinese firm, which is linked to a third market for export or potential export. Hence, each observation is a triplet (acquirer, target, export market). Our empirical analysis shows that (i) if a Chinese target has not exported to a market before a foreign acquisition (the non-exporting targets with respect to that market), the acquisition raises the likelihood of the target's export to that market; (ii) if a Chinese target has exported to a market before a foreign acquisition (the exporting target with respect to that market), the acquisition reduces the likelihood of the target's export to that market; and (iii) there is no significant technology transfer associated with foreign acquisitions. These results are also confirmed using the difference-in-differences technique.

Our paper is related to three strands of literature. The first is the FDI literature. Most early studies (both theoretical and empirical) are confined to a two-country framework to examine the motivations of FDI.<sup>2</sup> The focus is on what factors (economic, political, geographical, etc.) in the FDI source country and the FDI host country determine horizontal (or market-seeking) FDI and vertical (or cost-minimizing) FDI.<sup>3</sup> Recently, researchers started to pay attention to the long-ignored third-country effects of FDI. The third-country-effect studies emphasize that the third country's economic conditions affect the decisions of multinational firms from a country to invest in another country.<sup>4</sup> Export-platform FDI is one such example. A few theoretical models on the third-country effects have been proposed and analyzed, and some empirical studies have also confirmed the significance of the third-country effects.<sup>5</sup> Most of those multi-country models investigate the *incentive* of FDI.<sup>6</sup> In contrast, we develop our multi-country model to examine the *effects* of FDI. The study by Blonigen and Ma (2009) is most related to our paper in this regard. Their paper, however, examines whether the presence of FDI in China, especially the export-platform FDI, raises the local Chinese firms' export probability (the spillover effect), whereas but our paper investigates whether and why foreign acquisitions alter the Chinese target firms' export decisions (the direct effect). While all export-platform FDI studies show (by definition) that FDI increases the host country's export, our study shows that in some cases foreign acquisitions (an important type of FDI) reduce the target (host) country's export.<sup>7</sup>

The second strand of literature is the trade models with fixed export costs. Many empirical studies (e.g., Robert and Tybout, 1997) confirm the existence of substantial fixed costs of export. Melitz (2003) proposes a popular model to examine why high-productivity firms export while low-productivity firms do not, due to the existence of fixed export costs. This line of research implies that a firm does not export because it cannot overcome the fixed export

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<sup>2</sup>See Markusen (2002) for a review of the theoretical studies and Blonigen (2005) for a review of the empirical works.

<sup>3</sup>Seminal papers include Markusen (1984) for a model of horizontal FDI, Helpman (1984) for a model of vertical FDI, and Brainard (1997) for an empirical test.

<sup>4</sup>Note that both the traditional horizontal FDI, in which a multinational firm produces the final product in its subsidiary for the host market as well as in the parent firm for the source market, and vertical FDI, in which a multinational firm produces intermediate goods in the host country and final goods in the source country, can be analyzed using two-country models.

<sup>5</sup>See a review of this new (but small) literature by Blonigen et al. (2007).

<sup>6</sup>This group of studies consists of both theoretical and empirical analyses. Examples include Baltagi et al. (2007), Blonigen et al. (2007), Chen (2010), Coughlin and Segev (2000), Ekholm et al. (2007), Motta and Norman (1996), and Yeaple (2003).

<sup>7</sup>Blonigen (2001) has a good review of the theoretical and empirical literature on the substitution and complementarity between FDI and the multinational firms' export. As a supplement to this issue, our paper takes a different perspective by looking at how foreign acquisitions affect the targets' exports.

costs or it has low productivity.<sup>8</sup> Our study shows that ownership changes, due to foreign acquisition, may alter a firm's export extensive margin. With the change of ownership, the acquisition can help the targets overcome the fixed export costs including the financial costs and non financial costs such as lacking market network and unfamiliarity of the export markets. With the change of ownership, the acquirers may also transfer technologies to the targets to raise their productivity so that they can export. We find no evidence of technology transfer, but (indirect) evidence on fixed-cost jumping. Moreover, the target firms may start to export as a result of the multinationals' global market reorganization.

The third strand of the literature is cross-border M&As. Cross-border M&As are also FDI, but different from greenfield FDI. Surprisingly, cross-border M&As have received little attention in the trade/FDI literature despite the fact that cross-border M&As take up a larger share of FDI than greenfield FDI in reality. Existing studies try to explain the rationales for cross-border M&As,<sup>9</sup> and their effects on welfare, efficiency, and competition.<sup>10</sup> The present study makes a contribution to this literature by identifying (theoretically and empirically) a new rationale for cross-border acquisitions: global market reorganization.<sup>11</sup>

The rest of the paper is organized as follows. In Section 2, a three-country model of international acquisition and export is presented and an equilibrium analysis is conducted. In Section 3, we undertake an empirical analysis to test some of the predictions obtained from our model. We provide concluding remarks in Section 4.

## 2. Model and Equilibrium Analysis

This section is divided in two parts. In subsection 2.1, the model without acquisition is first presented, and then the no-acquisition equilibrium without acquisition is derived. In subsection 2.2, we introduce acquisition and analyze the effects of acquisition on the target firms' export decision. The main results obtained in this section are tested empirically in the next section.

### 2.1. The model without acquisition

Consider a world with three countries: the northern country (e.g., the US), denoted as  $N$ ; the southern country (e.g., China), denoted as  $S$ ; and the third country (e.g., Canada), denoted as  $O$ . Consider an industry in which firms produce differentiated products. We ignore the other decisions with regard to entry and exit to the industry because

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<sup>8</sup>One example of not being able to overcome the fixed export costs is when a firm faces credit constraint (not being able to borrow to finance the up-front fixed export costs). Chor and Manova (2010) find empirical support for the credit constraint argument for export.

<sup>9</sup>Qiu and Zhou (2006) show that cross-border mergers can be motivated by information sharing between firms from different countries. Neary (2007) argues that cross-border mergers arise as technology differences existing between firms in different countries. Nocke and Yeaple (2007) take the "resource-based view of the firm" to argue that firms are heterogeneous in their mobile and non-mobile capabilities, and show that the complementarities between internationally mobile and non-mobile capabilities can generate incentives for cross-border M&As. Nocke and Yeaple (2008) also emphasize the complementarities between headquarters and production divisions, and build an assignment theory of cross-border M&As in which better headquarters manage better production divisions. Head and Ries (2008) view cross-border M&As as manifestations of the international market for corporate control.

<sup>10</sup>See Head and Ries (1997) for the effects of cross-border mergers on welfare, and Qiu and Zhou (2006) for the effects on competition, industrial profit, consumer surplus, and welfare.

<sup>11</sup>Existing studies of export-platform FDI do not compare multinationals firms' choice between start-ups and acquisitions, neither does this paper. However, in this paper, we examine the effects on the target firms' export focusing on one type of export-platform FDI, namely, foreign acquisitions. In the international business literature (e.g., Barkema and Vermeulen, 1998), choosing between start-ups and acquisitions is an important question to ask.

our focus is on the firms' export decision. Accordingly, we assume that there are only a finite and fixed number of firms,  $m$ , competing in all three markets (countries). Each firm produces a distinct variety. Let  $M$  denote the set of the firms (varieties) in this industry.

The equilibrium where each firm optimally decides how much to sell to each market can be easily derived. However, to sharpen our focus on how a foreign acquisition affects the target's export decision, we assume the following market structure: there is only one firm from  $S$  called firm 1; there is only one firm from  $N$  called firm 2; and all other firms ( $m - 2$ ) are from  $O$ . Furthermore, assume that there is a constant marginal cost of production for each firm; it is  $c$  for firm 1 and zero for all other firms. Given this technology (constant returns to scale), the equilibrium in each market can be analyzed separately. As our interest is on how firm 2's acquisition of firm 1 affects these two firms' export decisions, let us focus our attention to the market in  $O$ .<sup>12</sup>

In market  $O$ , consumers derive utility from consuming the numeraire good and the industry's products

$$U = Q_0 + a \sum_{i \in M} q_i - \frac{1}{2} \sum_{i \in M} q_i^2 - \frac{b}{2} \sum_{i \in M} \sum_{j \in M_{-i}} q_i q_j,$$

where  $Q_0$  is the consumption of the numeraire good,  $q_i$  is the consumption of variety  $i$ ,  $a$  and  $b$  are constants, and  $M_{-i}$  is the industry's product set excluding variety  $i$ . The constant  $a$  captures the market size (of country  $O$ ), and  $b \in [0, 1]$  the degree of product differentiation between any two varieties. Consumers maximize their utility subject to their budget constraint. This maximization yields the following demand functions for the differentiated products with  $p_i$  as the price of variety  $i$ :

$$p_i = a - q_i - bQ_{-i}, \quad \text{where } Q_{-i} = \sum_{j \in M_{-i}} q_j.$$

Following the literature, we assume that there is a fixed cost of export,  $f$ , for each firm. The firms need to pay the fixed cost up-front before exporting. To further sharpen the difference between firm 1 and firm 2, we assume that firm 2 does not have the problem of paying the fixed export cost up-front, but firm 1 may. The trade cost (including transport cost) per unit of sales for firm 1 is  $t_1$  and that for firm 2 is  $t_2$ .

Suppose that firm 1 does not have the problem of paying the fixed export cost up-front and  $t_i$  is not too large; thus, all  $m$  firms compete in the market ( $O$ ) by choosing their quantities, a la Cournot. Then the profit functions are

$$\begin{aligned} \pi_1 &= (a - q_1 - bQ_{-1} - t_1 - c)q_1 - f, & \text{for firm 1,} \\ \pi_2 &= (a - q_2 - bQ_{-2} - t_2)q_2 - f, & \text{for firm 2,} \end{aligned}$$

and  $\pi_i = (a - q_i - bQ_{-i})q_i$  for all other firms. Each firm chooses its output level to maximize its profit, taking other

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<sup>12</sup>Similarly, Ekhom et al. (2009) assume no domestic demand in the host country. Their model is more specific than ours.

firms' output levels as given. The resulting equilibrium outputs for firms 1 and 2 are

$$\begin{aligned} q_1^* &= \frac{(A-1)(2-b)a - [2+b(m-3)][A(t_1+c) - t_2]}{b(2-b)(A^2-1)}, \\ q_2^* &= \frac{(A-1)(2-b)a - [2+b(m-3)][At_2 - (t_1+c)]}{b(2-b)(A^2-1)}, \end{aligned}$$

where  $A \equiv \frac{2+b(m-2)}{b} > 1$ . As a result, the equilibrium profits are

$$\begin{aligned} \pi_1^* &= [2+b(m-3)]^2 \left\{ \frac{(2-b)a - b[A(t_1+c) - t_2]}{b^2(2-b)(A^2-1)} \right\}^2 - f, \\ \pi_2^* &= [2+b(m-3)]^2 \left\{ \frac{(2-b)a - b[At_2 - (t_1+c)]}{b^2(2-b)(A^2-1)} \right\}^2 - f. \end{aligned}$$

There are two other interesting market structures to consider.<sup>13</sup> First, firm 1 does not export to the market but firm 2 does, in which case firm 2 competes with all other  $m-2$  firms. This case emerges in equilibrium if firm 1 has the problem of paying the fixed export cost up-front and/or  $t_1$  is too large, but  $t_2$  is not too large.<sup>14</sup> The Cournot equilibrium with the  $m-1$  firms can be derived in a similar way. Specifically, firm 2's profit is given as

$$\pi_2^0 = \left\{ \frac{(2-b)a - [2+b(m-3)]t_2}{[4+2b(m-3) - b^2(m-2)]} \right\}^2 - f$$

Second, firm 2 does not export to the market but firm 1 does, in which case firm 1 competes with all other  $m-2$  firms. This case arises if  $t_2$  is too large,  $t_1$  is not very large, and firm 1 does not have the problem of paying the fixed export cost up-front. The resulting profit for firm 1 is

$$\pi_1^0 = \left\{ \frac{(2-b)a - [2+b(m-3)](t_1+c)}{[4+2b(m-3) - b^2(m-2)]} \right\}^2 - f.$$

## 2.2. Acquisitions

Suppose that firm 2 acquires firm 1. The objective of the present paper is not to examine the economic reasons for cross-border acquisitions, but rather the effects of foreign acquisition on exports.<sup>15</sup> Thus, our focus is not on

<sup>13</sup>There is another case with regard to market structure in country  $O$  before the acquisition, which is, neither firm 1 or firm 2 export. However, this case is included in our analysis after the acquisition in the next subsection, and so we omit it here.

<sup>14</sup>There are many situations in which firm 1 cannot overcome the fixed costs of export: it faces a financial constraint, maybe it is not able to establish a foreign market network.

<sup>15</sup>See Qiu and Zhou (2006) for an example of cross-border M&A analysis. A more complete model of cross-border M&A based on the present one is like this. Consider a two-stage game. The first stage is the acquisition stage and the second stage is the production and market stage. Suppose that cross-border acquisition is not allowed by the governments and so that the pre-acquisition equilibrium market configuration/structure is given as those derived in subsection 2.1 under various conditions. As in the literature, we can derive the optimal decision of acquisition by comparing the sum of firm 1 and firm 2's profits before the acquisition and that after the acquisition. However, such an analysis in the present model is a lot

the benefits of the acquisition, but on how the acquirer maximizes the global profit by changing the production and export decisions of the two merging firms. In particular, after the acquisition, firm 2 has the full ownership of firm 1 and makes the following decisions on (i) whether to help firm 1 overcome the fixed costs of export; (ii) whether to transfer technology to firm 1 so that firm 1's marginal cost will be reduced from  $c$  to zero; (iii) whether to withdraw firm 1 from the export market if firm 1 exports before the acquisition; (iv) whether to enter or withdraw itself from the export market; and (v) the level of sales of firm 1 and that of firm 2 to the export market. There is a cost,  $C_T$ , of transferring technology from firm 2 to firm 1. We can classify the main actions typically associated with the acquisition into three types:

- (i) *fixed-cost jumping*, in which case, the acquirer helps the target overcome the fixed costs of export;
- (ii) *technology transfer*, in which case, the acquirer transfers technology to the target to raise the target's productivity; and
- (iii) *market reorganization*, in which case, the acquirer alters the pre-acquisition export configuration of the two firms.

Market competition will be different after the acquisition even if the set of firms in the market is the same as that before the acquisition. In particular, when both firms 1 and 2 are in the market, they choose their export levels,  $q_1$  and  $q_2$ , to maximize their joint profit  $\pi_1 + \pi_2$ . The resulting output and profits are (where superscript  $a$  stands for acquisition)

$$\begin{aligned}
q_1^a &= \frac{(B-1)(2-b)a - [2+b(m-3)][B(t_1+c) - t_2]}{b[4+b(m-4)](B^2-1)}, \\
q_2^a &= \frac{(B-1)(2-b)a - [2+b(m-3)][Bt_2 - (t_1+c)]}{b[4+b(m-4)](B^2-1)}, \\
\pi_1^a &= \{(2-b)a - [2+b(m-3)](t_1+c)\} \frac{(B-1)(2-b)a - [2+b(m-3)][B(t_1+c) - t_2]}{b[4+b(m-4)]^2(B^2-1)} \\
&\quad - D \left\{ \frac{(B-1)(2-b)a - [2+b(m-3)][B(t_1+c) - t_2]}{b[4+b(m-4)](B^2-1)} \right\}^2 - f, \\
\pi_2^a &= \{(2-b)a - [2+b(m-3)]t_2\} \frac{(B-1)(2-b)a - [2+b(m-3)][Bt_2 - (t_1+c)]}{b[4+b(m-4)]^2(B^2-1)} \\
&\quad - D \left\{ \frac{(B-1)(2-b)a - [2+b(m-3)][Bt_2 - (t_1+c)]}{b[4+b(m-4)](B^2-1)} \right\}^2 - f,
\end{aligned}$$

where  $B \equiv \frac{(2-b)[2+b(m-2)]}{b[4+b(m-4)]} > 1$ , and  $D \equiv \frac{b(m-2)(1-b)}{[4+b(m-4)]} > 0$ .

After the acquisition, firm 2 will choose the market configuration and outcome to achieve the largest joint profit. There are five possible outcomes as described in the following table.<sup>16</sup>

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more tedious, although it is straightforward, because there are too many cases to compare, depending on the pre-acquisition market structure, the post-acquisition market structure, and whether technology transfer occurs.

<sup>16</sup>There is another action not listed in the table, which is "technology transfer, only firm 2 exporting," but obviously firm 2 will never choose this action.



Case	Joint Profit	Outcome
1	$\Pi_1 = \pi_1^0$	no technology transfer, only firm 1 exporting
2	$\Pi_2 = \pi_2^0$	no technology transfer, only firm 2 exporting
3	$\Pi_3 = \pi_1^0(c=0) - C_T$	technology transfer, only firm 1 exporting
4	$\Pi_4 = \pi_1^a + \pi_2^a$	no technology transfer, both firms exporting
5	$\Pi_5 = \pi_1^a(c=0) - C_T + \pi_2^a(c=0)$	technology transfer, both firms exporting

Note that which outcome results in the largest profit is independent of the pre-acquisition export configuration. Denote  $\Pi = \max\{\Pi_1, \Pi_2, \Pi_3, \Pi_4, \Pi_5\}$ . Once the best outcome is determined, we will know whether and how the target firm's export extensive margin will be changed by the acquisition.<sup>17</sup>

Suppose that firm 1 does not export to the market before the acquisition. Its export decision remains unchanged after the acquisition if  $\Pi_2 = \Pi$ ; and in all other cases, firm 1 will export. Hence, the implication of acquisition on the target's export extensive margin is clear: foreign acquisition increases the target's export extensive margin except in case 2. A question is how the acquisition increases the extensive margin. This question is answered in the following proposition.

**Proposition 1.** *Suppose that the target firm does not export to a market before the acquisition. Then acquisition increases the target's export extensive margin. The increase is the result of one or more of the following actions taken by the acquirer:*

- (i) *fixed-cost jumping to help the target overcome the fixed-cost problem,*
- (ii) *technology transfer to raise the target's productivity, and*
- (iii) *self-withdrawing from the export market to let the target substitute it.*

Proof. See Appendix.

It is well known in the literature that if a firm does not export, it is likely that the fixed cost is too high and/or the firm's productivity is too low (e.g., Melitz, 2003; Ekholm et al., 2009). Our proposition shows that foreign acquisitions may help the target firm overcome these two problems. More importantly, our proposition indicates that the foreign acquirer's market reorganization strategy also makes the target firm's export profitable.

As fixed-cost jumping (e.g., capital injection to alleviate the credit constraint faced by the target) and technology transfer are two familiar actions taken by the acquirers in acquisitions, our next task is to further investigate the less-known motive for acquisition, namely, global market reorganization. In particular, we ask under what conditions,

<sup>17</sup>Note that if firm 1 and firm 2 can share part of the fixed export costs (e.g., distribution channel), then  $\Pi_4 = \pi_1^a + \pi_2^a + sf$  and  $\Pi_5 = \pi_1^a(c=0) - C_T + \pi_2^a(c=0) + sf$ , where  $s \in [0, 1]$  captures the degree of cost sharing. Thus, it is more likely to have  $\Pi_4 = \Pi$  or  $\Pi_5 = \Pi$  than the case without cost sharing. However, the qualitative aspects of all results in this paper remain unchanged.

global market reorganization occurs. Trade and transport costs are known to be important factors that affect export-platform FDI (e.g., Ekholm et al., 2009). Thus, we examine how they are related to multinational' global market reorganization strategy. The following proposition is obtained.

**Proposition 2.** *Suppose that the target firm does not export to a market before the acquisition. Then market reorganization occurs if and only if  $t_1$  is sufficiently small relative to  $t_2$ . Market reorganization is always accompanied by either fixed-cost jumping or technology transfer.*

Proof. See Appendix.

We next turn to the second situation in which firm 1 exports to the market before the acquisition. Note that firm 1's export decision will be altered after acquisition if  $\Pi_2 = \Pi$ ; but in all other cases, its export decision remains unchanged after the acquisition. We can establish the following proposition.

**Proposition 3.** *Suppose that the target firm exports to a market before the acquisition. Then acquisition **reduces** the target's export extensive margin. The decrease is the result of the acquirer's global market reorganization strategy (withdrawing the target from the export market), which occurs if and only if  $t_2$  is sufficiently small relative to  $t_1$ .*

Proof. See Appendix.

As shown in the proof, firm 1 withdraws from the export market after the acquisition only in the case where both firms compete in the market before the acquisition. Although both firms make a profit before the acquisition, competition results in a small profit for each firm. After the acquisition, they rationalize the competition by withdrawing one firm from the market. Firm 1 exits the export market if it is more efficient to keep firm 2, considering both the productivity and trade costs.

The result that acquisition increases the target non-exporter's export extensive margin and reduces the target exporter's export extensive margin may seem trivial at first glance, because the direction of change in the respective case is the only choice. However, the change does not need to occur. The two propositions (1 and 3) show that foreign acquisition *does* make the change happening, and provide conditions for the change.

### 3. Empirical Analysis

In Section 2, we have analyzed the effects of foreign acquisitions on the target firm's export extensive margin. In this section, our theory is brought to the data to see if the evidence supports the predictions of the theory. Note that although Propositions 1-3 are derived from a simple model with three countries only, it is easy to show that the propositions hold in a model with more than three countries. For example, there may be five countries and we can consider that firm 1 exports to country 4 but not country 5 before the acquisition. We then examine how an acquisition from a firm in country 2 affects firm 1's export decisions to country 4 and country 5; how an acquisition from a firm in country 3 affects firm 1's export decisions to country 4 and country 5; and how these two effects

are different. In any case, the qualitative aspect of the three propositions obtained in the preceding section remains unchanged.

In our empirical analysis, we take China as the southern country (the target country) to see how foreign acquisitions of Chinese firms alter the target Chinese firms' export extensive margin. China is chosen because of the following three reasons. First, China is a large exporting country and an important country for export-platform FDI. Second, there are increasingly more and more foreign acquisitions in China. Third, foreign acquisitions normally have better technologies than Chinese firms, which fits our model with respect to potential technology transfer.

### 3.1. Data

To test all the predictions from our theory, an ideal data set should at least include information of foreign acquisitions of Chinese firms, Chinese firms' exports to individual foreign countries before and after the acquisitions, characteristics of the Chinese firms, and characteristics of the foreign acquiring firms. Two datasets are very useful for this purpose. One is from Thomson Financial Securities Data Company (SDC) and the other is from the Chinese Customs. As the export data available for us are from the year 2000 to 2006, our study covers this period only.

SDC is the most widely used database for M&A studies. It intends to include all M&A deals worldwide. It provides rich information of each M&A deal, including the date and value (if available) of the transaction, the acquirer's and the target's names, nations and industries, and many items from the firms' financial statements. From the SDC database, we find 1564 Chinese manufacturing firms that were acquired by foreign manufacturing firms during the 2000-2006 period.<sup>18</sup> Although China began its economic reform and open-door policy in 1979, it remained very closed with respect to foreign acquisitions before the 1990s. The policy changes made in the 1990s have allowed more foreign acquisitions in China. Consequently, the number of foreign acquisitions grew rapidly, especially after China's accession to the WTO in 2001.

The Chinese Customs Database has detailed information of every export transaction by the Chinese firms, including the date and value of the shipment, the destination country, and the name, industry, and location of the exporter (the firm). Among the 1564 firms acquired by foreign firms during the 2000-2006 period, 661 had positive exports to some countries in some years during the same period.<sup>19</sup> The Chinese Customs Database contains a complete record of Chinese firms' exports, and thus, we can regard a firm's export to a specific country in a specific year as zero if there is no such a record of export in the database. Note that the other 903 Chinese firms acquired by foreign firms had no export in the entire period. Clearly that those acquisitions are motivated by market entry, that is, foreign firms acquire the Chinese firms to enter the Chinese market. Since those foreign acquisitions have very different motives from those focused on the present study (i.e., export-platform acquisitions), they can be excluded from the basic regression of our empirical analysis.<sup>20</sup>

Recall that our model is about acquirers and targets in the same industry (when the degree of product differen-

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<sup>18</sup>As we are concerned about export extensive margin, our model is more appropriate for analyzing manufacturing M&As than M&As in the service sector.

<sup>19</sup>We identify those 661 firms by searching each of the 1564 Chinese target firms (from the SDC Database) in the Chinese Customs Database. We first match them by the firm's name, and double check them by their location and industry.

<sup>20</sup>However, we also perform a robustness check using *all* target firms including those 903 firms.

tiation  $b$  is close to 1), similar industries (when  $b$  is not close to 1 nor zero), or even unrelated industries (when  $b$  is close to zero). Hence, in our empirical analysis, we should exclude other cases. As it is commonly done in the literature, all acquisitions can be classified into three categories: horizontal acquisitions, vertical acquisitions, and conglomerate acquisitions.<sup>21</sup> Among the 661 acquisitions of Chinese firms with positive exports in our sample, 204 (30.86%) are horizontal, 18 (2.72%) are vertical, and the rest 439 (66.42%) are conglomerate. This distribution is comparable to the distribution of worldwide M&As found by Gugler et al. (2003). We should obviously exclude, and only exclude, vertical acquisitions from our analysis, which accounts for a very small share of the total acquisitions.

In one robustness test of our basic empirical results, we need to find a control group constructed from a set of the Chinese firms not acquired by foreign firms in our study period. To construct the control group and run the regression including firms from the control group, another data source is used to obtain the non-target Chinese firms' financial data. This data source is the Chinese Industrial Enterprise Database, which is maintained by the National Bureau of Statistics of China (NBS). The NBS conducts annual surveys of all state-owned manufacturing enterprises and "above-scale" private manufacturing enterprises with annual sales of or above five million Chinese Yuan (about USD750,000 at the exchange rate RMB6.67 per dollar when this paper was written). The database provides detailed information including each firm's name, industry, location, and many operation and financial items.

### 3.2. Acquisition effects on target firm's export (extensive margin)

Our theoretical predictions indicate that the foreign acquisition will *raises* the target firm's likelihood of exporting (extensive margin) to a given country if the target firm does not export to that country before the acquisitions (Proposition 1), but the acquisitions will *lower* the target firm's likelihood of exporting to a given country if the target firm does export to that country before the acquisitions (Proposition 3).

#### 3.2.1. The basic regression

Like most of the empirical studies in the international trade literature, we use the gravity model approach to analyze a target firm's export decision. The most interesting variable that we introduce to the modified gravity model is the acquisition dummy, as shown in our empirical model given below:

$$DEX_{fkt} = \alpha + \alpha_0 EX0_{fk} + \beta ACQ_{ft} + \beta_0 ACQ_{ft} \cdot EX0_{fk} + \gamma GDP_{kt} + D_f + D_k + D_t + \varepsilon_{fkt}, \quad (1)$$

where the dependent variable,  $DEX_{fkt}$ , is a binary export variable equal to one if firm  $f$  exports to country  $k$  in year  $t$ , and zero otherwise;  $ACQ_{ft}$  is the acquisition dummy equal to one if firm  $f$  is acquired by a foreign firm in or before year  $t$ , and zero otherwise; and  $EX0_{fk}$  is the export dummy equal to one if firm  $f$  has exported to country  $k$  before the acquisition, and zero otherwise. We control for the market size effect ( $GDP_{kt}$ , which is country  $k$ 's GDP in year  $t$ ), firm fixed effect ( $D_f$ ), country fixed effect ( $D_k$ ), and year fixed effect ( $D_t$ ).  $\varepsilon_{fkt}$  is the heteroscedasticity

<sup>21</sup>Following the widely used criterion in the literature, we use the 2002 US Input-Output table to classify all acquisition deals. If both the acquirer and the target are from the same industry at the 4-digit SIC level, the deal is considered as a horizontal acquisition; if the production of one dollar of the product in the industry which the acquirer (target) belongs to requires at least 10 cents of input from the other industry which the target (acquirer) belongs to, the deal is classified as a vertical acquisition; others are treated as conglomerate acquisitions.

robust standard error term. Note that the target country's (China's) GDP is captured by the year fixed effect, the country fixed effect includes distance, and the firm fixed effect captures the average characteristics of each firm that may affect the firm's export decision, for example, size, productivity, product quality, etc.<sup>22</sup>

We run the OLS regression of (1) with 256,851 observations in total. The regression results are reported in column (1) of Table 1. We normally run Logit model when the dependent variable takes the value 0 or 1. However, as first noted by Neyman and Scott (1948) and discussed by Greene (2004) among many others, estimators of nonlinear panel data models with fixed effects can be severely biased due to the incidental parameters problem. People, therefore, generally employ the OLS model in these cases and generate consistent estimators. This approach is followed.<sup>23</sup>

<Table 1 Here>

We can observe that the importing country's GDP has a significant and positive effect on the target firms' export decision, which is a common finding in the literature. As for the key explanatory variable, i.e., foreign acquisition ( $ACQ$ ), it is clear that for firms without export to a country before the acquisitions ( $EX0_{fk} = 0$ ), their likelihood of exporting to that country *increases* significantly after the acquisition, with the corresponding coefficient being 0.0197, as shown by column (1). This finding is consistent with the prediction of Proposition 1. In contrast, for firms with export to a country before the acquisitions ( $EX0_{fk} = 1$ ), their likelihood of exporting to that country *decreases* significantly after the acquisition. The corresponding coefficient is  $-0.0943 (= 0.0197 - 0.104)$  as shown in column (1). The F-test is conducted which confirms that  $\beta + \beta_0 < 0$ . This finding supports the prediction of Proposition 3.

### 3.2.2. Robustness

In this subsection, we perform a number of robustness checks on the basic results obtained in the preceding subsection. The results survive in all robustness tests.

#### ■ Firm-country fixed effect

There may be some firm-country specific factors that affect a firm's exporting decision to a given country. For example, if a firm produces ski equipment and does not export to a country, then a foreign acquisition may increase its probability of exporting to that country if there is a demand for ski equipment in that country (e.g., the country has cold winter), but the acquisition is unlikely to change the firm's export probability to that country if the country is in a tropical area (i.e., there is no demand for ski equipment). To take these factors into account, we re-run the regression, model (1), by introducing the firm-country pair fixed effect ( $D_{fk}$ ) and dropping the firm fixed effect ( $D_f$ ) and country fixed effect ( $D_k$ ). The results are reported in column (2) of Table 1. All the corresponding estimates in columns (1)

<sup>22</sup>Note that we do not include firm  $f$ 's productivity level in year  $t$  as an independent variable. This contemporary productivity variable is a bad control variable because it is affected by our key independent variable  $ACQ$  as emphasized by Angrist (2008). Moreover, the firm fixed effect has included the firm's initial productivity level, which affects export decision, but is not affected by  $ACQ$ .

<sup>23</sup>We have also tried the Logit model with year, importer, and industry (but not firm) fixed effects, firms' initial productivity, and firms' initial size. All results are the same as in the OLS model. We cannot control for the firm fixed effect because it is too inefficient to estimate the model due to too many fixed effects.

and (2) clearly have the same sign and significant level, while the R-square is greatly improved in column (2). In particular, for firms without export to a country, their likelihood of exporting to that country *increases* significantly after the acquisition, with the corresponding coefficient being 0.0254 as shown in column (2). In contrast, for firms with export to a country before the acquisitions, their likelihood of exporting to that country *decreases* significantly after the acquisition, with the corresponding coefficient  $-0.1166 (= 0.0254 - 0.142)$  as shown by column (2).

#### ■ Acquirer's country

Although the two predictions with regard to the acquisition's effects on the target firms' export extensive margin do not depend on the characteristics of the acquirer's country, there are reasonable doubts that in reality the nature of the acquirer's country matters. Take the US and Hong Kong as examples. First, these two economies are very different in terms of their GDP levels, proximity to China, business structures, size of their multinational companies, etc. The US acquirers could be more driven by market entry motives while the Hong Kong acquirers could be more motivated by using the Chinese firms as a low production base for serving the export markets. To see if our basic results are sensitive to the acquirer country's characteristics, we run one regression based on the subsample in which all acquirers are from the US, and another regression based on the subsample in which all acquirers are from Hong Kong. These are the top two economies which acquire Chinese firms. In the 2000-2006 period, the US had 21.08 per cent and Hong Kong accounted for 18.14 per cent of all foreign acquisitions in China. The regression results for the US [in column (3)] and those for Hong Kong [in column (4)] have the same signs and significance level, which are the same as those obtained in the basic model based on acquisitions from all countries.

#### ■ The whole sample of target firms

Recall that in the above empirical analysis we rely on the data from the 661 Chinese target firms that had some exports during the period 2000-2006. Although some of the other 903 Chinese target firms that had no export during the period of our study are acquired by foreign firms without the intention to change the targets' export decisions, there could be some in which the foreign acquirers are not able to change the targets' export decisions even if they want to. If that is the case, excluding them without the intention from the test will bias our estimation.

We have rerun the basic regression model (1) using all 1564 target firms' data, and the results are qualitatively the same as in the baseline estimation. In particular, the estimate of ACQ is 0.00619 (compared to 0.0197 in column 1 of Table 1), the estimate of ACQ\*EX0 is  $-0.0822$  (compared to  $-0.104$  in column 1 of Table 1), and the sum is negative. All are statistically significant.

#### ■ Difference-in-differences approach

Our simple OLS regression results have shown the correlation between foreign acquisitions and the Chinese target firms' export extensive margin. They may not tell us the causal effects of foreign acquisitions on the targets' export extensive margin unless the acquisition decisions of the foreign firms are exogenous to the target firms. However, this "exogenous" assumption may not be valid. Foreign firms do not choose targets randomly. Foreign firms may prefer Chinese firms with a larger size so as to expand their market-entry motivated production in China more rapidly; they may acquire smaller Chinese firms in order to have better control of the targets; they may choose Chinese firms with higher labor quality and capital intensity to better complement their superior technology and

management. Other features of the Chinese firms such as age, type of industry, location, and ownership, may also affect the foreign firms' acquisition decisions.<sup>24</sup> All these pre-acquisition characteristics of the Chinese firms may also affect their export decision in the future, regardless of whether or not they are acquired. If this target selection factor exists, the above estimation of the acquisition effects will be biased.

To correct this potential (sample selection) bias, or to find the true effects of foreign acquisitions on the targets' export extensive margin, there should be information about the target firms' exporting decision if they were not acquired. However, this information is counterfactual. Following the literature, a control group is constructed and the difference-in-differences technique is employed to perform the test.<sup>25</sup>

We first use the propensity score matching technique (Rosenbaum and Rubin, 1983) to find a control group for the target firms (the treatment group), and then employ the difference-in-differences strategy to check the treatment effect of foreign acquisitions on export extensive margin.<sup>26</sup> The control group is constructed as follows. For each target firm in our sample, we find a corresponding independent firm, defined as a Chinese firm not acquired by any foreign firm in the entire period of the study and is most similar to the target firm before the acquisition. The criterion of similarity is the propensity score, that is, the probability of being acquired by the same foreign firm. To obtain the acquisition probability, the following acquisition model is constructed: the dependent variable is a dummy of a Chinese firm as a target of foreign acquisition; the independent variables include the corresponding firm's characteristics such as firm size (employment), labor productivity (constant value of output per employee), capital intensity (asset-labor ratio), liability ratio (liability-asset ratio), short-term debt ratio (short-term debt over cash flow), firm age, location (province), industry, and year. We run the OLS regression using all data from the Chinese Industrial Enterprises Database, which includes both the target and non-target Chinese firms. Then, based on the regression model with the estimated coefficients, we calculate each firm's acquisition propensity score: for each target firm, the score is calculated using the firm's characteristics in all the years before the acquisition; and for each independent (non-target) firm, the score is calculated using the characteristics in all the years in the 2000-2006 period. After obtaining the propensity score of each firm including all target firms and all independent firms, we use the criterion of the nearest neighbor matching to find the independent firm for each target firm as its counter part in the control group. Given that the control firm has similar probability of being acquired as the treated firm, within each pair of the treated firm and the control firm, the acquisition is regarded as a random pick and the export behavior of the control firm is taken as the counterfactual of the treated firm. We then estimate the treatment effect of foreign acquisitions on export extensive margin after controlling for the fixed effect of each matched pair of firms.

Although there are 1564 Chinese firms acquired by foreign firms in our study period, we can find detailed pre-acquisition information for only 532 of them and obtain their propensity scores.<sup>27</sup> Among those 532 target firms, our propensity score matching finds 352 of them with control firms, while others have some items of information

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<sup>24</sup>There are systematic differences between the target and non-target firms in the US domestic acquisitions. Liu and Qiu (2010) find that the targets on average have better performance measures (size, profitability, productivity, etc.) than those firms not acquired by any firms. Such a pattern may also exist in international acquisitions.

<sup>25</sup>The difference-in-differences strategy is widely used in the literature of program evaluation, for example, Heckman et al. (1997).

<sup>26</sup>This approach is also adopted by Huttunen (2007) and Bandick and Görg (2010) in their studies of foreign acquisition's effect on employment.

<sup>27</sup>Again, we found those 532 firms by searching each of the 1564 Chinese target firms in the Chinese Industrial Enterprise Database. We first match them by the firm's name, and then double check them by the location and industry.

missing for the estimation of propensity scores.

Different from the usual treatment analysis which normally has a unique treatment year, the treatments (i.e., acquisitions) in our case may happen in different years for different firms. That is, there is no single treatment year for the whole sample. Hence, for each pair of target firm and its corresponding control firm, the year when the acquisition of the target firm is executed is taken as the treatment year. For each pair,  $v$ , we use  $v(1)$  to denote the treated firm and  $v(2)$  to denote the control firm; and we define a dummy (for the treated firm)  $AF_{v(1)t} = 1$  for every year  $t$  in and after the acquisition year (the treatment year) and  $AF_{v(1)t} = 0$  if  $t$  is before the acquisition year. Similarly, we define a dummy (for the control firm)  $AF_{v(2)t} = 1$  for every year  $t$  in and after the acquisition year and  $AF_{v(2)t} = 0$  if  $t$  is before the acquisition year.

Then, the treatment effect of foreign acquisitions on the target firms' likelihood of export is checked by running the following regression:

$$DEX_{v(i)kt} = \alpha + \beta_1 TR_{v(i)} + \beta_2 AF_{v(i)t} + \beta_3 TR_{v(i)} \cdot AF_{v(i)t} + \gamma GDP_{kt} + D_v + D_k + D_t + \varepsilon_{v(i)kt}, \quad (2)$$

where,  $i = 1, 2$ ,  $DEX_{v(i)kt}$  is the export dummy which is equal to 1 if  $v(i)$  has export to country  $k$  in year  $t$  and zero otherwise;  $TR_{v(i)}$  is the treatment group indicator, i.e.,  $TR_{v(1)} = 1$  and  $TR_{v(2)} = 0$ ;  $D_v$  is the dummy for each pair ( $v$ ) of the target firm and its corresponding control firm; and other variables are as defined before.

In the above model, we can see that all else equal and besides the common export likelihood captured by factors other than  $TR_{v(i)}$ ,  $AF_{v(i)t}$  and  $TR_{v(i)} \cdot AF_{v(i)t}$ , a treated firm's export likelihood before the acquisition is  $\beta_1$ , and its export likelihood after the acquisition is  $\beta_1 + \beta_2 + \beta_3$ ; thus, the difference in export likelihood between before and after the acquisition is  $\beta_2 + \beta_3$ . On the other hand, all else equal and besides the common export likelihood, a control firm's export likelihood before the acquisition is zero, and its export likelihood after the acquisition is  $\beta_2$ ; thus, the difference in export likelihood between before and after the acquisition is  $\beta_2$ . Therefore, the *difference* between the treated firms and control firms in their *differences* between post-treatment year exports and pre-treatment year exports (difference-in-differences) is  $\beta_3$ , which is the average treatment effect of foreign acquisitions on export extensive margin that we are focusing on.

To estimate model (2), let us divide our sample into two subsamples according to the treated firms' export history to each country before the acquisitions. Specifically, all the firm-country-pair observations  $(f, k)$  are divided into two sub-groups according to firm  $f$ 's export experience with country  $k$  before the acquisition: Group 1 includes all observations  $(f, k)$  in which the target firm  $f$  has not exported to country  $k$  before the acquisition, and Group 2 includes all other observations, i.e.,  $(f, k)$  in which the target firm  $f$  has exported to country  $k$  in some years before the acquisitions. We run regressions for these two groups separately. The regression results are reported in Table 2. We also include estimation results when firm-country fixed effect is introduced, those when the acquiring country is the US, and those when the acquiring firms are from Hong Kong. Clearly, that the treatment effect is qualitatively the same as the finding from the OLS regression using the pooled data (i.e., when the data are not divided to two groups). Note that column (1) of Table 2 reports the result for all destination countries in Group 1 without the firm-



country fixed effect.  $\beta_3$  (the coefficient of  $TR \cdot AF$ ) is positive (0.0449), indicating that the foreign acquisitions have increased the target firms' export extensive margin for those firms without prior export to the corresponding markets. The same qualitative result is obtained when firm-country dummy is introduced [column (2)] and when the acquirer country is controlled [column (3) for the US and column (4) for Hong Kong], respectively. Similarly, column (5) of Table 2 reports the result for all destination countries in Group 2 without the firm-country fixed effect.  $\beta_3$  is negative ( $-0.135$ ), indicating that the foreign acquisitions have reduced the target firms' export extensive margin for those firms with prior export to the corresponding markets. The same qualitative result is obtained when firm-country dummy is introduced [column (6)] and when the destination market is controlled [column (7) for the US and column (8) for Hong Kong], respectively. Therefore, the finding from the OLS regressions is valid, lending further support to the two predictions.

Model (2) has been estimated using data from the two groups separately to avoid too many interaction terms, which will complicate the estimation. We have also estimated the model using the pooled data and found similar results.

<Table 2 Here>

### 3.3. The channels: How do foreign acquisitions alter the target firms' export decision?

In Section 2, we have identified three possible channels (motives) for the foreign acquisitions to affect the targets' export behavior. In this subsection, we make the first attempt to test whether those three channels are valid ones and which ones are actually used in the foreign acquisitions of the Chinese firms. However, to test those channels directly, more data than we can obtain are needed. Alternatively, we first focus on the possibility of technology transfer and then based on that result, discuss the other two channels.

We assume that technology transfer occurs if the target firm's productivity increases after the acquisition because we do not have data on technology transfer. To this end, we run the following OLS regression:

$$PRODUCTIVITY_{ft} = \alpha + \beta ACQ_{ft} + D_f + D_t + \varepsilon_{ft},$$

where  $PRODUCTIVITY_{ft}$  is firm  $f$ 's productivity in year  $t$ , and other variables are described as before. Here the firm fixed effect  $D_f$  controls for all initial characteristics of the firm that may affect its productivity.

There are several methods to measure productivity. The first is labor productivity (LBP), which is the constant-value output per employee. All recent theoretical models of heterogeneous firms emphasize the role of LBP in firms' exporting behavior. The second is total factor productivity (TFP), which can be estimated using the Solow residual at the firm level.<sup>28</sup> To estimate the Solow residual of the Chinese target firms, data of constant-value output, labor employment, constant-value intermediate inputs, and capital stock, all in logarithm are used. These can be obtained

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<sup>28</sup>However, as first emphasized by Marschak and Andrews (1944), taking the Solow residual as the measurement of productivity may suffer from the simultaneity problem, because firms may observe some parts of the productivity shocks (which is unobservable to econometricians) and take this into account in their input decisions. Ignoring this potential simultaneity problem will lead to biased estimation of productivity.

from the Chinese Industrial Enterprises Database. The third measure is the Levinsohn-Petrin productivity (LPP) as proposed by Levinsohn and Petrin (2003). This method can deal with the simultaneity problem associated with the Solow-residual TFP estimate, and is widely used in recent productivity literature.<sup>29</sup>

We use all three productivity measures, separately. The regression results are shown in the first three columns of Table 3. We observe that foreign acquisitions have no statistically significant effect on the target firms' productivity, whatever measurement of productivity is use.<sup>30</sup> This result is not surprising because similar results are found in other countries: Javorcik (2004) for Lithuania, Barbosa and Louri (2005) for Portugal and Greece, and Benfratello and Sembenelli (2006) for Italy. These researchers all find no effect of foreign ownership on the domestic firms' productivity. In addition, Harris and Robinson (2002) find that foreign acquisitions even decrease the UK target firms' productivity.

<Table 3 Here>

As before, to give a more rigorous test on the effects of foreign acquisitions on the Chinese target firms' productivity, we use the difference-in-differences strategy by specifying the following model:

$$PRODUCTIVITY_{v(i)kt} = \alpha + \beta_1 TR_{v(i)} + \beta_2 AF_{v(i)t} + \beta_3 TR_{v(i)} \cdot AF_{v(i)t} + D_k + D_t + \varepsilon_{v(i)kt},$$

where the right-hand-side variables have been defined in model (2). The results are reported in columns 4-6 in Table 3, which confirms the qualitative nature of the results from the basic model.

Thus, *technology transfer is not observed in foreign acquisitions of Chinese targets, and is, therefore, not an important channel through which foreign acquisitions affect the Chinese targets' exporting behavior.* This finding complements that of Blonigen and Ma (2009), who find some indirect technology transfer through learning and/or spillover from foreign invested enterprises in China to local Chinese firms. We focus on the direct technology transfer from the foreign acquirers to their Chinese target firms.<sup>31</sup>

Although there are no available data to test the other two channels, namely, fixed-cost jumping and market reorganization, we can at least infer the results indirectly. First, the same qualitative results can also be obtained when we focus only on the targets which do not have export to a foreign market before the acquisition. If our theoretical model is correct, then the combination of the result that foreign acquisitions increase the Chinese targets' export extensive margin for those targets which do not have exports before the acquisitions and the result that there is no technology transfer associated with the acquisitions indicates that either fixed-cost jumping or market reorganization works. Moreover, even if market reorganization is a reason for the increase in the target's export extensive margin, fixed-cost jumping is also used along with the market reorganization because Proposition 2 indicates that market

<sup>29</sup>There is still another method proposed by Olley and Pakes (1996), which also addresses the same problem as Levinsohn and Petrin (2003). However, because we do not have exact market entry and exit information of the firms, we cannot calculate the Olley-Pakes productivity.

<sup>30</sup>We also run the regressions based on two different countries/regions, the US and Hong Kong, as the acquirers' countries/regions. The results are the same: the effects of acquisitions on the Chinese targets' productivity are not statistically significant.

<sup>31</sup>There is no systematic finding on technology transfer from acquirers to targets in other countries' data. Using data of mergers around the world, Gugler et al. (2003) find that efficiency improvement is only found in mergers with small firms.

reorganization is always accompanied by either fixed-cost jumping or technology transfer. Additionally, the empirical analysis above has shown that technology transfer is not present. Hence, *fixed-cost jumping is a key factor to increase the Chinese target firms' export extensive margin by foreign acquisitions*.

Finally, a first-step direct test of the market reorganization effect is provided. Both Propositions 2 and 3 indicate that market reorganization strategy is determined by the relative value of  $t_2$  to  $t_1$ . Given that we do not have the detailed trade costs, following most of the literature, distance is used to represent trade cost. Accordingly, we introduce a differential distance dummy variable  $DDIST_{fk}$ , which is equal to one if  $(t_2 - t_1)/t_2$  is very large but zero otherwise. To be more precise, we calculate  $(\ln t_2 - \ln t_1)$  for all country pairs and set  $DDIST_{fk} = 1$  if the corresponding  $(\ln t_2 - \ln t_1)$  are greater than the 75th percentile of all  $(\ln t_2 - \ln t_1)$  in the whole sample and  $DDIST_{fk} = 0$  otherwise.<sup>32</sup> We then run the following regression:

$$\begin{aligned} DEX_{fkt} = & \alpha + \alpha_0 EX0_{fk} + \beta ACQ_{ft} + \beta_0 ACQ_{ft} \cdot EX0_{fk} + \alpha_1 DDIST_{fk} + \beta_1 ACQ_{ft} \cdot DDIST_{fk} \\ & + \gamma GDP_{kt} + D_f + D_k + D_t + \varepsilon_{fkt}. \end{aligned}$$

Both Propositions 2 and 3 predicts that  $\beta_1$  is positive. This is confirmed by our regression result, as reported in Table 4.

<Table 4 Here>

## 4. Concluding Remarks

A three-country model has been developed to examine the effect of foreign acquisitions on the target firms' decision to export to the third market. We show that if the targets have no exports before the acquisitions, foreign acquisitions will increase the targets' export extensive margin through three channels: fixed-cost jumping, technology transfer, and global market reorganization. However, if the targets have exports before the acquisition, the foreign acquisitions will reduce the targets' export extensive margin in accordance with the acquirers' global market reorganization strategy. These theoretical predictions are confirmed using the firm-level data on foreign acquisitions of Chinese firms from 2000 to 2006. Moreover, we find that technology transfer does not occur after the foreign acquisitions, fixed-cost jumping is used to raise the targets' export extensive margin, and global market reorganization is a key motive for the acquirers to reduce the targets' export extensive margin.

Our paper makes a contribution to the studies of FDI in a multi-country setting. Specifically, foreign acquisitions (an important type of FDI) and their effects on the target firms' export behavior are examined. In contrast to the prediction from models of export-platform FDI, foreign acquisitions may reduce the target country's export. Global market reorganization is found as a motivation of foreign acquisitions and it has a significant effect on exports.

The main predictions of our model are consistent with the data on foreign acquisitions of Chinese firms. It will be useful to conduct further empirical research along the following two directions. First, we could directly test the

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<sup>32</sup>We also use the 90th percentile as the critical value to define  $DDIST$ . The empirical conclusion does not change.

multinational firms' global market strategy if we have information about each foreign acquirer's export decision in each of the third market before and after the acquisition. Second, data on foreign acquisitions of other countries' firms should be used to test our theory.

## Appendix

### A. Proof of Proposition 1

The analysis before the proposition gives the possibility of the effect of the acquisition on the target's export extensive margin. We now show the channels through which the acquisition affects the target. According to our model, there are two possibilities for firm 1 not to export before the acquisition: it cannot overcome the fixed export cost and its productivity is not high enough. If  $\Pi_1 = \Pi$  or  $\Pi_4 = \Pi$ , because there is no technology transfer, it must be the case that firm 2 helps firm 1 jump over the fixed costs; if  $\Pi_3 = \Pi$  or  $\Pi_5 = \Pi$ , then firm 2 transfers technology to firm 1. Note that market reorganization occurs in the case when  $\Pi_1 = \Pi$  or  $\Pi_3 = \Pi$ , and when firm 2 does export before the acquisition.

### B. Proof of Proposition 2

Firm 2 will make firm 1 export if by doing so the joint profit from the market is larger. There are two cases with regard to firm 2's export status in the market. First, firm 2 does not export before the acquisition, that is,  $\pi_2^0 \leq 0$ . As the acquisition will not change the profitability of firm 2's original plant, firm 2 will not export to the market after the acquisition. It will help firm 1 to export if it can raise firm 1's export profit. Obviously, there is no market reorganization because the result does not change firm 2's export decision.

Second, firm 2 exports before the acquisition, that is,  $\pi_2^0 > 0$ . Note that market reorganization occurs if and only if firm 1 exports while firm 2 withdraws from the market after the acquisition, that is, either  $\Pi_1$  or  $\Pi_3$  is the largest profit. Suppose that without technology transfer  $\Pi_1 > \max\{\Pi_2, \Pi_4\}$ . By a simple comparison, we know that  $\Pi_1 > \Pi_2$  if and only if  $t_1 + c < t_2$ . We next compare  $\Pi_1$  and  $\Pi_4$ . Note that  $\Pi_4$  increases in  $t_2$ ; when  $t_1$  decreases,  $\pi_1^0$  increases faster than  $\Pi_4$  because  $q_1^0 > q_1^a$ . Although there is a cost saving  $f$  from  $\Pi_4$  to  $\Pi_1$ , it should be firm 1 not firm 2 to withdraw from the market if  $t_1$  is not sufficiently small relative to  $t_2$ . Hence, the necessary and sufficient condition for  $\pi_1^0 > \pi_1^a + \pi_2^a$  is  $t_1$  being sufficiently small relative to  $t_2$ . The final question is if  $t_1$  is sufficiently small relative to  $t_2$  while firm 2 has a better technology, why before the acquisition firm 1 does not export but firm 2 does. The only possibility is that firm 1 faces a fixed cost constraint. Therefore, the increase in firm 1's export extensive margin through market reorganization must go together with fixed-cost jumping.

Suppose that with technology transfer  $\Pi_3 > \max\{\Pi_2 - C_T, \Pi_5\}$ . A simple comparison shows that  $\Pi_3 > \Pi_2 - C_T$  if and only if  $t_1 < t_2$  is not large. The second comparison is reduced to  $\pi_1^0(c=0) > \pi_1^a(c=0) + \pi_2^a(c=0)$ . Clearly, the comparison is similar to the comparison between  $\Pi_1$  and  $\Pi_4$ ; and so the necessary and sufficient condition is  $t_1$  being sufficiently small relative to  $t_2$ . In this case, firm 1 not exporting before the acquisition may not be because of fixed-cost jumping, but because of low productivity. In any case, the extensive margin change through market reorganization goes with technology transfer in this case.

Whether  $\Pi_1$  or  $\Pi_3$  is larger depends on  $c$  and  $C_T$ , but it is clear from the above analysis that it does not affect the qualitative nature of the proposition.

### C. Proof of Proposition 3

There are two cases with regard to firm 2's export status in the market before the acquisition. First, firm 2 does not export before the acquisition, that is,  $\pi_2^a \leq 0$ . Note that market reorganization occurs and firm 1's export extensive margin changes if and only if firm 1 withdraws while firm 2 starts exporting to the market after the acquisition. This is not an equilibrium outcome because if  $\pi_2^0 > \pi_1^0$ , it should be firm 2 exporting to the market before the acquisition.

Second, firm 2 exports before the acquisition, that is,  $\pi_2^a > 0$ . Note that market reorganization occurs and firm 1's export extensive margin changes if and only if firm 1 withdraws while firm 2 remains exporting to the market after the acquisition, that is,  $\Pi_2$  is the largest profit. Suppose that without technology transfer we have  $\Pi_2 > \max\{\Pi_1, \Pi_4\}$ . By a simple comparison, we know that  $\Pi_2 > \Pi_1$  if and only if  $t_1 + c > t_2$ . We next compare  $\Pi_2$  and  $\Pi_4$ . Note that  $\Pi_4$  increases in  $t_1$ ; when  $t_2$  decreases,  $\Pi_2$  increases faster than  $\Pi_4$  because  $q_2^0 > q_2^a$ . Although there is a cost saving  $f$  from  $\Pi_4$  to  $\Pi_2$ , it should be firm 1 not firm 2 to withdraw from the market if  $t_2$  is sufficiently small relative to  $t_1$ . Hence, the necessary and sufficient condition for  $\Pi_2 > \Pi_4$  is  $t_2$  being sufficiently small relative to  $t_1$ .

Suppose that with technology transfer  $\Pi_2 - C_T > \max\{\Pi_3, \Pi_5\}$ . A simple comparison shows that  $\Pi_2 - C_T > \Pi_3$  if and only if  $t_2 < t_1$ . Turning to the second inequality,  $\Pi_2 - C_T > \Pi_5$ , it is clear that the comparison is similar to the comparison between  $\Pi_2$  and  $\Pi_4$ ; and so the necessary and sufficient condition is  $t_2$  being sufficiently small relative to  $t_1$ .

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**Table 1. Effects of foreign acquisitions on the targets' export extensive margin**

	(1)	(2)	(3)	(4)
Dependent variable: Dummy of Export				
Acquirer nation	ALL	ALL	US	HK
ACQ	0.0197*** (0.00150)	0.0254*** (0.00141)	0.0108*** (0.00353)	0.0288*** (0.00307)
ACQ*EX0	-0.104*** (0.00517)	-0.142*** (0.00535)	-0.0648*** (0.0110)	-0.139*** (0.0107)
EX0	0.472*** (0.00338)		0.488*** (0.00740)	0.467*** (0.00688)
GDP	0.0402*** (0.00682)	0.0406*** (0.00732)	0.0513*** (0.0154)	0.0524*** (0.0137)
Constant	-0.803*** (0.132)	-0.710*** (0.138)	-1.023*** (0.298)	-1.029*** (0.265)
Year FE	yes	yes	yes	yes
Firm FE	yes	no	yes	yes
Country FE	yes	no	yes	yes
Firm-Country FE	no	yes	no	no
p-value of F-test: ACQ+ACQ*EX0 < 0	0.0000	0.0000	0.0010	0.0000
Observations	256,851	256,851	51,627	63,837
R-squared	0.450	0.637	0.480	0.426

Robust standard errors are in parentheses. \*\*\*, \*\*, and \* denotes significance level of 0.01, 0.05, and 0.1, respectively.

**Table 2. Treatment effect of foreign acquisitions on the targets' export extensive margin**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable: Dummy of Export								
Sample	To countries without prior export experience				To countries with prior export experience			
Acquirer nation	ALL	ALL	US	HK	ALL	ALL	US	HK
TR*AF	0.0449*** (0.001000)	0.0467*** (0.00110)	0.0509*** (0.00245)	0.0496*** (0.00220)	-0.135*** (0.00710)	-0.152*** (0.00681)	-0.113*** (0.0154)	-0.173*** (0.0152)
TR	0.00321*** (0.000289)	-0.000229 (0.000388)	0.00690*** (0.000789)	0.000827 (0.000510)	0.304*** (0.00547)	0.0905*** (0.00595)	0.303*** (0.0119)	0.322*** (0.0121)
AF	-0.00840*** (0.00109)	-0.00933*** (0.00114)	-0.00250 (0.00218)	-0.0240*** (0.00317)	0.0133*** (0.00350)	0.0188*** (0.00290)	-0.0140* (0.00790)	0.0452*** (0.00788)
GDP	-0.00836** (0.00382)	-0.00785** (0.00396)	-0.00942 (0.00912)	-0.000683 (0.00853)	0.265*** (0.0184)	0.294*** (0.0181)	0.329*** (0.0422)	0.251*** (0.0415)
Constant	0.155** (0.0739)	0.146** (0.0741)	0.169 (0.177)	0.0189 (0.165)	-5.316*** (0.358)	-5.703*** (0.345)	-6.546*** (0.820)	-4.987*** (0.807)
Year FE	yes	yes	yes	yes	yes	yes	yes	yes
Match pair FE	yes	no	yes	yes	yes	no	yes	yes
Country FE	yes	no	yes	yes	yes	no	yes	yes
Match pair-Country FE	no	yes	no	no	no	yes	no	no
Observations	192765	192765	38583	43624	118414	118414	23566	24340
R-squared	0.085	0.307	0.082	0.096	0.392	0.642	0.426	0.385

Robust standard errors are in parentheses. \*\*\*, \*\*, and \* denotes significance level of 0.01, 0.05, and 0.1, respectively.

**Table 3. Technology transfer and productivity changes**

	(1)	(2)	(3)	(4)	(5)	(6)
Productivity	LBP	TFP_SR	TFP_LP	LBP	TFP_SR	TFP_LP
ACQ	-390.6 (258.9)	-0.0316 (0.0477)	207.5 (202.4)			
Constant	679.6*** (80.02)	12.11*** (0.0440)	20.32 (26.89)	991.2*** 991.2***	12.18*** 12.18***	103.2 103.2
TR*AF				26.21 (51.84)	0.00140 (0.0393)	155.6 (145.8)
TR				-8.733 (33.71)	0.0251 (0.0243)	-68.85 (66.95)
AF				-73.07 (56.23)	-0.0325 (0.0365)	54.84 (54.64)
Firm FE	yes	yes	yes			
Match Pair FE				yes	yes	yes
Year FE	yes	yes	yes	yes	yes	yes
Observations	1817	1817	1817	2321	2321	2321
R-squared	0.335	0.937	0.171	0.998	0.935	0.170

Robust standard errors are in parentheses. \*\*\*, \*\*, and \* denotes significance level of 0.01, 0.05, and 0.1, respectively.

**Table 4. Test of global market reorganization strategy**

	(1)	(2)
Dependent variable: Dummy of Export		
ACQ	0.0161*** (0.00165)	0.0231*** (0.00160)
ACQ*EX0	-0.0995*** (0.00556)	-0.139*** (0.00576)
ACQ*DDIST	0.0128*** (0.00231)	0.00825*** (0.00271)
DDIST	-0.00433** (0.00180)	
EX0	0.471*** (0.00359)	
GDP	0.0313*** (0.00692)	0.0311*** (0.00739)
Constant	-0.626*** (0.134)	-0.530*** (0.139)
Year FE	yes	yes
Firm FE	yes	no
Country FE	yes	no
Firm-Country FE	no	yes
Observations	235,083	235,083
R-squared	0.444	0.632

Robust standard errors are in parentheses. \*\*\*, \*\*, and \* denotes significance level of 0.01, 0.05, and 0.1, respectively.